10/567785
IAP20 Rec'd PCT/PTO 09 FEB 2006

GRINDING OR POLISHING MACHINE

The invention relates to a grinding and/or polishing machine for cereals like rice, wheat or other grain types, with a grinding and/or polishing rotor or paring rotor enveloped by a sieve.

Conventional grinding or polishing machines, in particular grinding machines, have an array of sieve segments mounted to an articulated axis at a peripheral end, while the second peripheral end can bed pivoted around this axis in such a way as to project more or less into the space filled by the cereals to be processed. The purpose of this is to provide an elevated resistance for the cereals entrained by the rotor toward the free end of the sieve segment through inward adjustment, thereby producing friction between the rotor and cereals, or between the cereals.

The "cereals" referred to in this patent application can relate to the most varied of cereals. While this treatment is used for rice or even wheat, it is sometimes also used for other grain types. In addition, the use of these machines has also been proposed for coffee beans.

To assist in the sifting and separation of bran particles from the ground, polished or even pared grain, the rotors have a hollow shaft with openings through which compressed air is blown into the working area. The hollow shaft is connected with a fan/compressed air generator for this purpose.

In order to achieve a constant product pressure in the working area, and hence a constant paring or polishing level, a baffle plate that can be adjusted in such a way as to have a counterforce act against the product

pressure is placed in front of the working area outlet. The counterforce is most often set manually with a lever gear/rod assembly based on empirical values.

The object of the invention is now to improve the known structural design while avoiding the described disadvantages in such a manner as to achieve a uniform polishing, grinding or paring of the grain. The object is achieved with the features in the patent claims.

The rotor shaft of the paring, grinding or polishing machine is designed in a known manner as a hollow shaft with through openings for air on the jacket surface, but air inters the hollow shafts from both sides of the face. This enables a uniform ventilation of the working area. In another embodiment, the rotor shaft is advantageously wedge-shaped, and the air through slits are vertically arranged.

The use of toothed belts for driving the rotor shaft also helps to balance out the performance of the machine. The performance rises at a low power demand and with nearly no slippage.

The contact force level has a direct effect on the degree of paring, grinding or polishing. A pneumatic membrane drive with axially secured force transducer is located outside the working area, before the product outlet. A constant contact force can be generated on the baffle plate with this arrangement. The previous method of setting the contact force manually with weights is electropneumatically simulated in this way.

This makes it significantly easier to offset fluctuations in product pressure owing to varying product density (the baffle plate "wanders" depending on product density).

Therefore, only the contact pressure must be measured, and constantly adjusting the weights is no longer necessary. A more compact, dynamic control unit makes it possible not just to regulate the impact pressure (contact force) more precisely under operating conditions, but also to more dynamically configure machine startup. Tolerance bands monitor the contact force, engine current and a controlled pressure in the membrane.

In particular the use of conventional electric or pneumatic drives made it possible to continuously actuate the baffle plate with low tolerances (narrow band) via the membrane-activated "drive" of the baffle plate plug. It is particularly advantages that the seal setting can be kept open even given a power failure.

The product stream pressure on the baffle plate generates a force that is compared with a counterforce. This force generated by the product is directly absorbed, i.e., immediately by a small spring between the lever mechanism and force transducer, and physically stored while the controller performs measurements. The newly calculated force adjustment based on this system change or irregularity in force conditions is compensated via electric control valves.

The compressed air in the membrane drive, and hence the contact force on the baffle plate, are thereby adjusted until equilibrium has been restored. The value is adjusted exclusively to a constant contact force independent of the apparent density.

Additional details of the invention are discussed based on the following description of the exemplary

embodiment shown diagrammatically in the drawing. Shown on:

Fig. 1 is a longitudinal section through a vertical grinder according to the invention;

Fig. 2 is a schematic cross-section of an arrangement for controlling the impact pressure.

A vertical grinder 1 has a drive motor 2 for a grinding rotor 4. The overdrive is realized by means of several toothed belts 3. Situated around the grinding rotor 4 is a perforated basket 4, which is connected to an extractor 6 for the ground bran particles. The grinding rotor 4 exhibits conventional grinding tools and longitudinal air through openings in the axial direction. The grinding rotor 4 is mounted in a main bearing 7.

The grinding rotor 4 is designed as a hollow shaft 8, and has an upper air inlet 9 and lower air inlet 10. The air is supplied via one or two fans (not shown). Because air is uniformly supplied over the entire length of the working area 14, the processed grain is heated to less on an extent, and the bran is treated and removed more uniformly.

The grinding motor 4 is slightly wedge-shaped, wherein the diameter is smaller at the top than the bottom. Wear is more uniform.

In addition, an impeller that acts like a fan can be provided to support the airflow in the working area 14.

The product exits the outlet 11 at the top. A baffle plate seals the product outlet. The baffle plate 12 can

move vertically, and its movement is controlled via a membrane drive 13.

The membrane drive 13 can be arranged as depicted, or inside the casing of the vertical grinder 1. In like manner, the rotor can also have polishing or paring tools, and/or be arranged horizontally.

An electronic unit 20 monitors and regulates the membrane drive 13 using the control valves 21. The current contact force is recorded by a force transducer 22 and read into the electronic unit 20. A specific contact force can be directly set on the device (locally) or via a process control system (remotely).

A pneumatically controlled lever mechanism 23 controls the product-dependent contact force preset on the electronic unit 20. A small spring 24 absorbs the change in lever force triggered by the product. At the same time, the slightly bent spring 24 compensates for the transverse forces on the force transducer 22.

If the engine current exceeds a limit set in the electronic unit 20, the lever mechanism 23 is automatically disengaged.

Reference Marks

1	Vertical grinder
2	Drive motor
3	Toothed belt
4	Grinding rotor
5	Perforated basket
6	Extractor
7	Main bearing
8	Hollow shaft
9	Air inlet
10	Air inlet
11	Product outlet
12	Baffle plate
13	Membrane drive
14	Working area
20	Electronic unit
21	Control valve
22	Force transducer
23	Lever mechanism
24	Spring